Mobility of Matter." Here we confess we felt nonplussed, and as the rest of the work (pp. 321-523) seems, on a hasty glance, to be of the same sort, varied only by occasional extravagant eulogy of some philosophers and denunciation of others, we leave it unnoticed, except as regards one particular which will afterwards be referred to.

We now come to the richest part of the volume, the preface and introduction, written (as we are told) later than the rest, and therefore when the author had managed thoroughly to divest himself of all the usual amenities, as well as of regard for at least the scientific character of certain living philosophers.

From the introduction we paraphrase as follows (the passage follows some fierce remarks about Dr. Tyndall):—

> "I can assert that, when I read the addresses of Sir W. Thomson and Prof. Tait to the British Association, and when on my return to Leipzig I found on my table among the scientific novelties the German edition of their 'Natural Philosophy,' edited by Helmholtz and Wertheim (including particularly section 385), then, indeed, the appearance of my work seemed to be a *Naturprocess*; something necessary in the chain of scientific development, of which even I myself scarce knew how it had arisen, and what was my share in it. In fact, the desire to bring to light in this book what is more or less struggling to appear in German science, what is bringing out a hollow sound now from one string, anon from another; this desire, I say, has been with me to the latest scratch of my pen. I therefore doubt not that, simultaneously with mine, other heads have been working at the same problem, and perhaps in unconscious coincidence have arrived at the same solution. May then such facts ever more forcibly impress us with the conviction that the claims of personal services belong much more to the Age and to the Race than to the individual, and that no ever so clear conscious selection of means can be compared with that wonderful harmony with which Nature seeks to farther, and at the same time more surely to reach, her to us unknown ends."

To understand the bearing of the above passage, which is simply a literal assertion of

Deutschland, Deutschland über Alles,
Ueber Alles in der Welt,

the reader must refer to the preface, where he will find (along with much metaphysics) a war-dance over the mangled scientific reputation of Sir W. Thomson. The celebrated "moss-grown fragments from the ruins of another world" was a joke taken in earnest by many even in this country; so we can hardly blame Prof. Zöllner for falling into the trap; but why "bewachsene" instead of "bemooste" in translating the passage for thy countrymen, O Zöllner? Prof. Zöllner's remarks upon British philosophers as a class must be given in his own words:—"Allein die Speculation ist in der gegenwärtigen Entwickelungsphase der Naturwissenschaft ein so tief empfundenes Bedürfniss, dass selbst hein eut fast nur noch *inductiv* thätiges Volk, wie die Engländer, der Versuchung nicht widerstehen kann, sogar über *mathematisch-physikalischen Hypothesen* zu speculiren."

Then we have the old question about the discovery of Spectrum Analysis, Stokes and Balfour Stewart now coming in along with Thomson for their share of the *grêle de coups*. So severely accurate a judge as Zöllner should, however, have known that Stewart has pointed out that Kirchhoff mistook his meaning when he charged him with error as to the expression for internal radiation in terms of the refractive index. A sentence from Prof. Tait's address to Section A, last August, is used as a sort of weapon against British scientific men. Prof. Zöllner here quotes the part that suits him, leaving out altogether the portion (immediately following) which turns the charge entirely the other way.

Another indefensible style of controversy we must allude to as exhibited by our author. In the above extract from his introduction it will be noticed that he specially alludes to Section 385 of Thomson's and Tait's book. In the preface we find the following condemnation of it, which is calculated to ensure notoriety. "I venture deliberately to assert that in the whole of German physical literature there cannot be found one single text-book which, in the short space of only thirty lines, contains such a plentitude of *absolute* nonsense." It is true there is a jokelet in this (now) celebrated section, something about catching a luminous corpuscle and examining it—it forms the text for a good many severe remarks; but Prof. Zöllner goes further, and accuses the authors of the work of discourtesy to Weber, which certainly no one who understands the original or the German translation (which we have taken the trouble to consult) will find in either.

Whether Thomson and Tait, with Helmholtz and Clerk-Maxwell on their side, or Weber with the assistance of Neumann (and Zöllner), shall ultimately be found correct on a purely scientific question, it is not our present business to inquire; what we do object to is the sensational imputation of discourtesy, if not of something worse, especially when the object of this imagined insult is a venerable philosopher who will undoubtedly leave a permanent mark on the history of his time.

It would next be our task to show how heartily Helmholtz is pitched into for having sanctioned by his name the Geman translation of the work in question, and for his worthy recognition of Sir W. Thomson's scientific discoveries; but enough—Deutschland über Alles, and down with every Deutscher who sees aught to admire or to respect beyond the limits of Germany!

CONCRETE ARITHMETIC

Concrete Arithmetic; an Introduction to the Elements of the Abstract Science of Number. For young Children. By Temple Augustus Orme. (Groombridge and Sons, 1872.)

"SIR, according to the custom of this town, he is of age when he knows how to count up to twelve pence; and he shall answer in a writ of right when he is of that age."[*] The work before us will not only enable a pupil to do this, but further gives an excellent account of the first six processes enumerated in the old poem[†]:—

Septem sunt partes, non plures, istius artis;
Addere, subtrahere, duplareque dimidiare
Sextaque dividere est, sed quinta est multiplicare
Radicem extrahere pars septima dicitur esse.

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[*] Year-book of Edward I., A.D. 1292. Salop Iter., edited by Horwood, p. 220.

[†] The *De Algorismo* quoted from Halliwell's "Rara Mathematica," by De Morgan, "Arithmetical Books," p. 15.

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The passage from the one rule to the next is very gradual, but never tedious; there is copious explanation, but yet we think no superfluous verbiage. Every page is to the point, and marks the writer as one who has had practically to deal with the sort of young minds for whom his work is primarily if not solely intended. The book is a thoroughly rational one, though at first sight the reader may think he has stumbled by mistake upon an elaborate treatise on the subject of dominoes, for the method of teaching is based on a combination of what has been called "palpable" with written arithmetic. In actual teaching the palpable method is the one adopted. Mr. Orme's own words are, "Teachers are strongly recommended to take every available opportunity of using suitable blocks of wood to represent units, tens, hundreds, and thousands, and I should wish it to be distinctly understood that, without these blocks or some substitute for them, the subject will become too abstract to be comprehended by those for whose sole benefit this book has been compiled" (Preface, p. 4); and on p. 7 the resemblance of each diagram to a domino suggests the remark, "Learn to play at the game called dominoes; this will teach you how to tell the number of dots in a figure very quickly."

The main divisions are occupied with units, or single unpacked things; tens, or single unpacked deca-units; hundreds, or single unpacked hecto-units; and thousands, or single unpacked kilo-units. From some of the terms here employed, it might be supposed that the work treats principally of questions concerned with metres, decimetres, and other quantities, which require an acquaintance with the metric system; but this is not the case, though it is well fitted to serve as an introduction to the use of such a system. Special reference to this system is confined to two pages of "Directions," where the dimensions of a square centimetre are represented in a figure.

The following extract from the Preface will serve to show the spirit by which the writer is actuated:—"If the teacher proceeds in this way (*i.e.*, by the palpable method of using blocks) he will be amply rewarded by finding that children, not so stupid as they are often said to be, will frequently make out processes of their own for arriving at truths, having been taught to rely not on rules, but on reason; and occasionally the youngest pupil will unconsciously show his teacher how to teach. . . . . More good will arise from the introduction of a scientific method into the teaching of the ordinary subjects of education than will accrue from object lessons, or the freely-accepted dicta of men of science." In thus letting Mr. Orme speak for himself, we shall best put before our readers the object aimed at in his book—an object which he seems to us to have compassed; and as we think it is a right one, it is on this ground we venture to recommend the work to all who may be in search of a good elementary introduction to arithmetic. If they carefully follow out the advice given, and pursue the plan laid down, they will convey a sound and accurate view of the subject, and that without wearying the young student. There is good store of simple and varied exercises in this handy volume, which may readily be curtailed or enlarged, according to each individual case. The only typographical faults we have to point out occur on pp. 30, 104, and 105, and are readily corrected. We commend the book as the work of a "cunning" arithmetician. "It is pitie that commonlie more care is had, yea, and that emonges verie wise men, to finde out rather a cunnynge man for their horse, than a cunnyng man for their children."[*]

OUR BOOK SHELF

Contribution to the Biology and History of the Development of the Ustilagineæ. By Dr. A. Fischer von Waldheim. Translated for the Transactions of the New York State Agricultural Society for 1870. From "Pringsheim's Jahrbücher," vol. ii. part 1, 2, 1869. (Albany, New York: 1872.)

THE section of Fungi to which the Ustilagines belong has occupied considerable attention from mycologists during the past quarter of a century. Old notions of the autonomy of species have been dispersed, and at the present time all the old genera are suspected, some are condemned, and not a few amalgamated. The present condition of the classification of the Uredinous Coniomycetes is eminently transitional; so much has been written, so many observations made that await confirmation, or require further researches to render the work complete, that no one would be rash enough to predict what another twenty years may accomplish towards settling the relations of the genera in this group to each other. From the vague notions and doubts of Unger's "Exantheme" in 1833, Leveille's researches in 1839, Tulasne's first memoir in 1847, De Bary's "Brandpilze" in 1853, Tulasne's second memoir in 1854, there has been a regular advance in the accumulation of observations and the record of facts up to the publication of Fischer von Waldheim's communication in 1869. The relations of *Trichobasis* to *Puccinia*, of some species of *Lecythea* to *Melampsora*, of others to *Phragmidium*, are admitted on every hand; but whether *Trichobasis*, *Puccinia*, *Uromyces*, and *Æcidium*, shall all give way to an amalgamated genus, in which the four forms shall be recognised as four conditions of the same plant, though accepted by some, cannot yet be considered as settled beyond a doubt. The more sceptical of mycologists suspend their judgment, and await the confirmation of certain observations. Whatever the result may be, there can be but one opinion that such men as Tulasne, Leveille, De Bary, and others, deserve all commendation for the work they have accomplished. Whilst the Uredines Proper have suffered greatly in the stability of their generic distinctions, the Ustilaginous group has at present maintained its character for the autonomy of its species. Up to the present *Tilletia*, *Ustilago*, *Thecaphora*, and *Urocystis*, seem to represent comparatively stable genera. It is not impossible that this is more *seeming* than *real*, and that future workers may reveal affinities more close than as yet are suspected. The "contribution" of Fischer von Waldheim dates as far back as 1869, although now presented for the first time in an English dress, and we have to thank our Transatlantic cousins for having accomplished this fact. The New York State Agricultural Society is wise to diffuse this and all similar information amongst its members. None are more deeply interested in the development, conditions of growth, and metamorphisms (if any) of the "Smuts" than agriculturists, and to no societies should we look with more confidence for the publication of such memoirs as the present. How far they have accomplished this belongs to the past, and has become history; what they may do in the future lies within their own power. The memoir now published commences with a very good digest of the literature of the subject, after which follow the personal observations of the author on the mycelium and spore

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[*] Ascham, "The Schoolmaster," Book I.

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